(12)UK Patent Application (19)GB (11) 2 020 375 A

(21) Application No 7913621
(22) Date of filing
19 Apr 1979
(23) Claims filed
19 Apr 1979
(30) Priority data
(31) 9443
(32) 2 May 1978
(33) Italy (IT)
(43) Application published
14 Nov 1979
(51) INT CL² F17C 1/00
B60K 3/00
F03D 9/02
F03G 5/00
(52) Domestic classification
F1S 13 1 21 28B2 30 3 5
B7E 109 CX
B7H C4B V1B
F1T H2H2 W2D
(56) Documents cited
GB 1483847
GB 1478312
GB 1337383
GB 525069
GB 464312
GB 384844
GB 346377
GB 337439
GB 332055
GB 274552
(58) Field of search
F1G
F1S
F1T
(71) Applicant
Adone Ermini
17 Via Amendola
Incisa Valdarno
Firenze
Italy
(72) Inventor
Adone Ermini
(74) Agents
Barlow Gillett & Percival

# (54) System of storing energy as gas pressure

(57) A system for deriving energy from natural sources and storing it as gas pressure comprises a prime mover operated by the natural energy source and a compressed air reservoir. The prime mover may be a water turbine driving an air compressor 10 which supplies compressed air to a storage tank 14 from which it can be supplied to an air motor or turbine 16 for driving an electrical generator 18. The compressor may be driven by a wind motor, an animal driven roundabout or treadmill, or a stationary bicycle-type pedalling system. A bicycle is disclosed incorporating its own compressed air tanks which can be charged by pedalling with the driving wheel clear of the ground, and compressed air from the tanks can be used for propulsion.

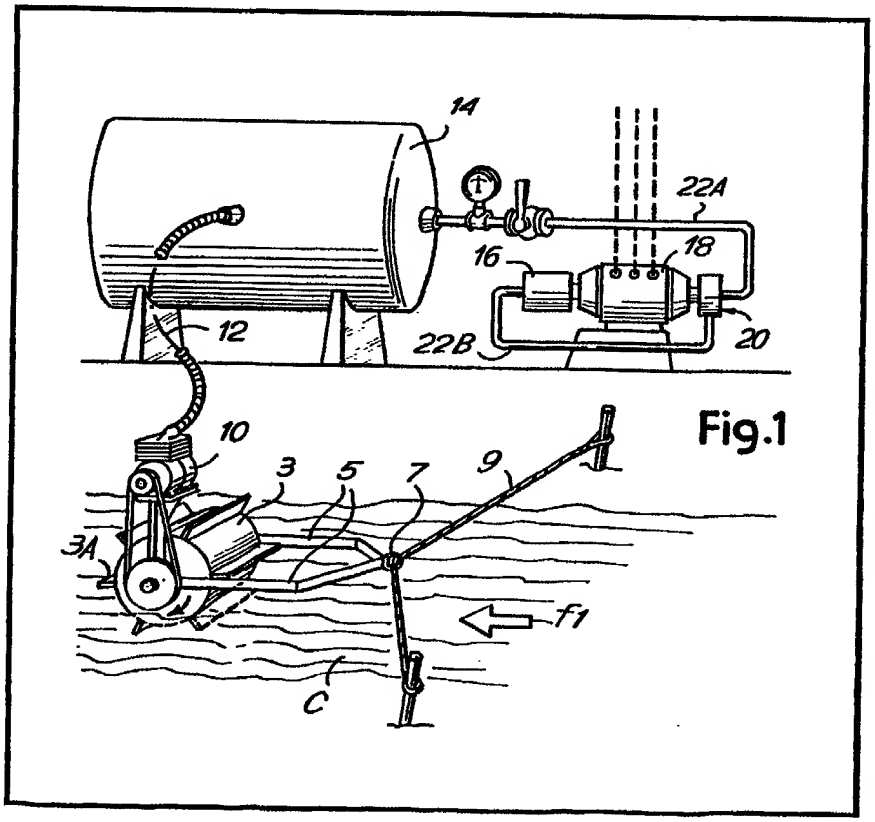



Fig.1

2020375

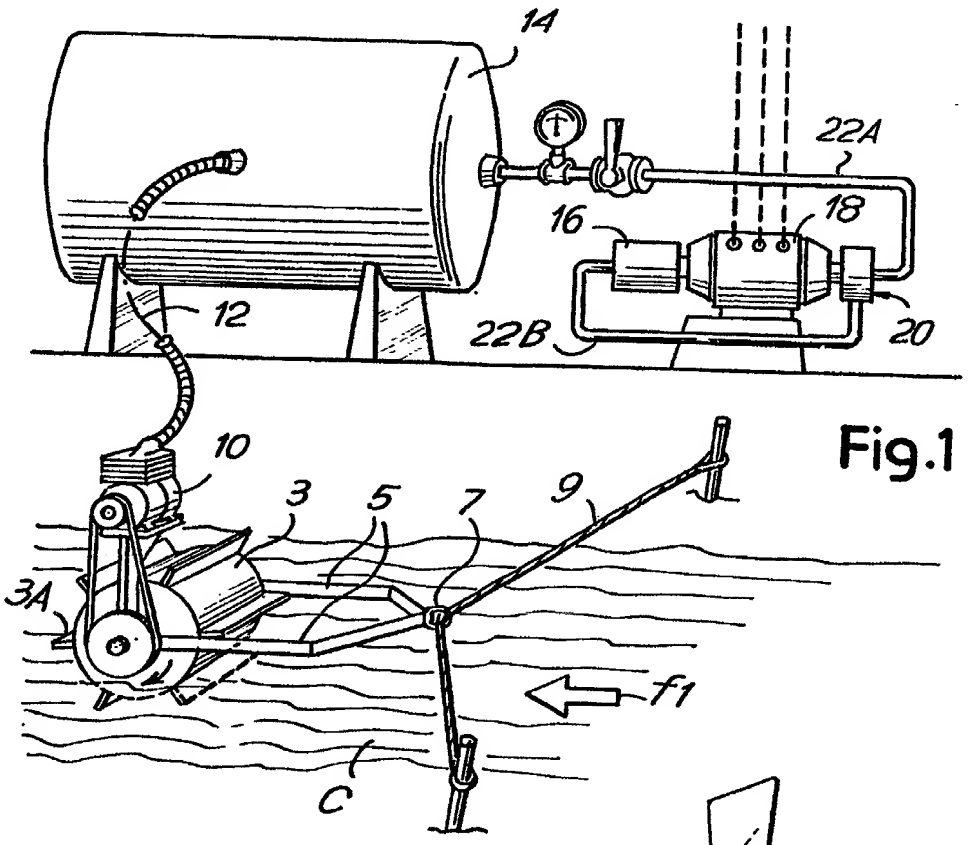



Fig.1

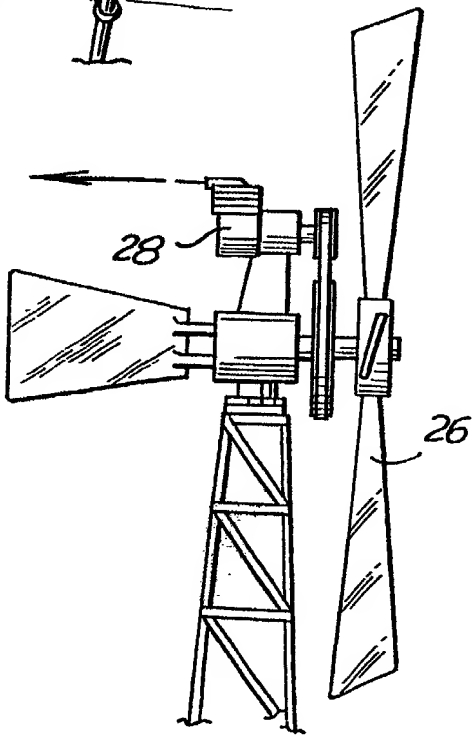



Fig.2

2020375

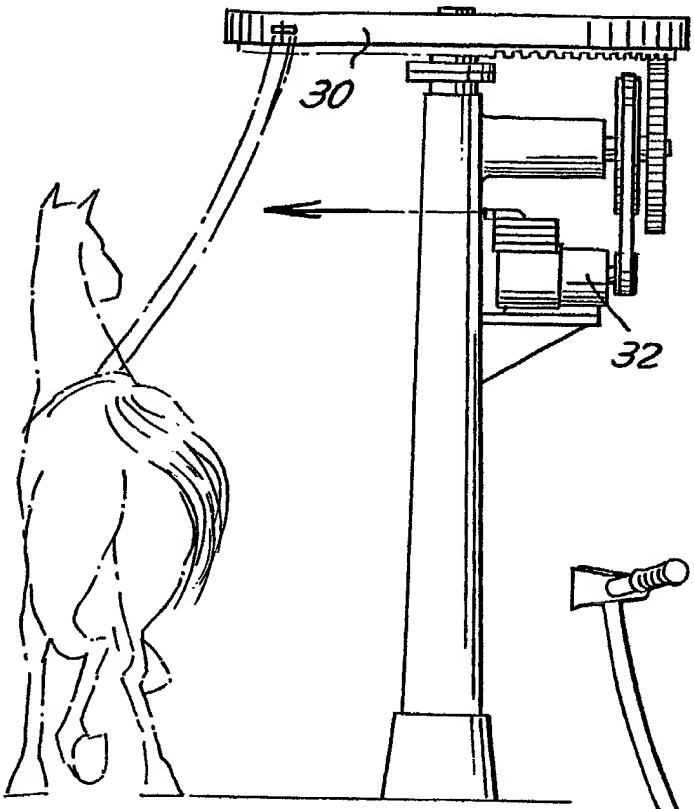
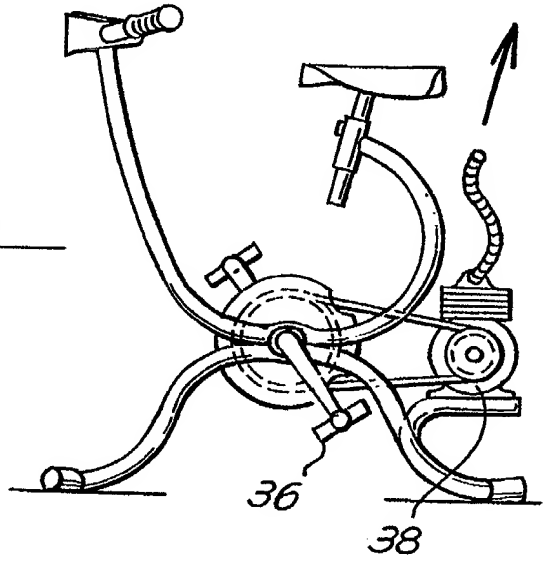



Fig. 3

Fig. 4



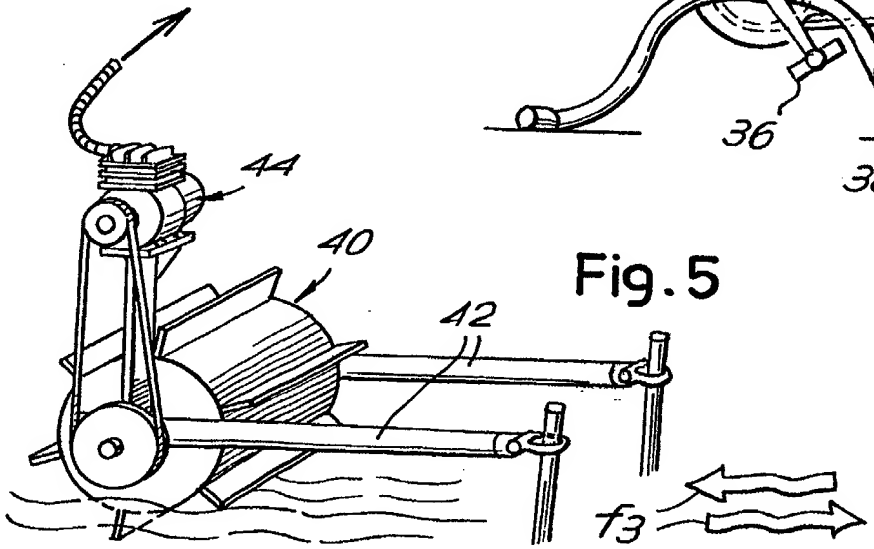




Fig. 5

Fig.6

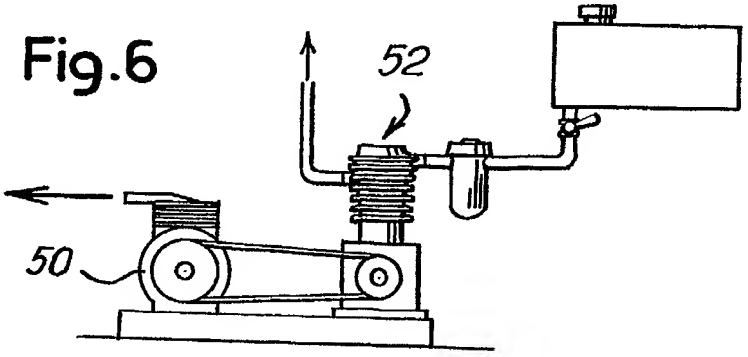
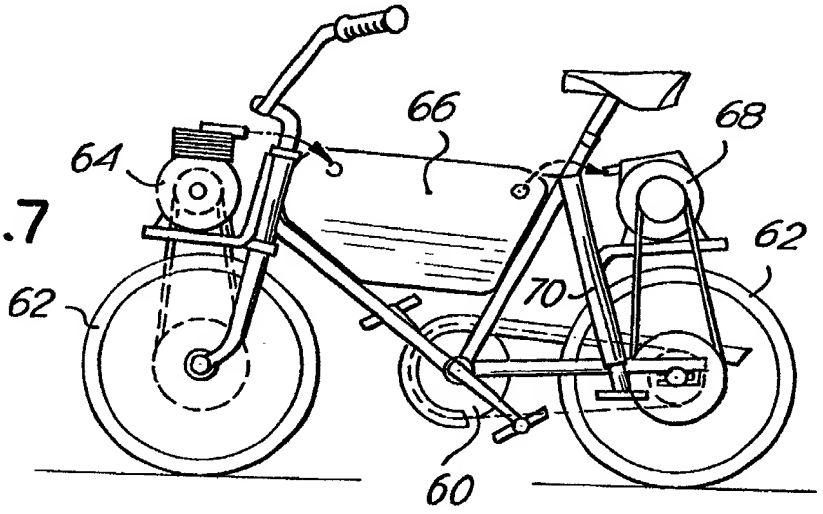



Fig.7



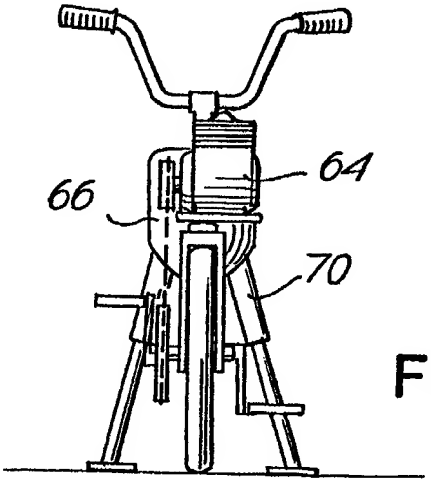




Fig.8

SPECIFICATION

**System of storing energy as gas pressure**

This invention relates to a solution to the problem of storing energy, howsoever obtained, through the exploitation of natural energies e.g. from the wind, from the flow of water, or from human or animal activity.

The storage system in accordance with the invention comprises an air compressor by a prime mover adapted to be powered by natural energy, to compress air which is accumulated in fluid pressure receiver means, of suitable capacity and of suitable resistance in relation to the air compressor and to the storage needs, from which receiver means the pressure energy is exploited as desired.

The prime mover in the system of the invention may comprise a wind motor, a hydrodynamic motor which derives its power from a current of water of a water course, or horizontal undulatory or wave motion along a sandy shore or beach or an animal motor or the like. The system of the invention may include auxiliary thermal motor for standby and use in case of prolonged absence of natural events from which energy can be derived.

As a hydrodynamic motor use may be made of a rotor having floating blades and restrained in an oscillating manner, for example on arms, which allow the oscillation thereof in accordance with variation in the level of the water on which the rotor floats the rotor having, for example radial blades, which are impinged upon by the current of water to rotate the rotor.

Also the possibility is not excluded of storing the energy derived from human or animal muscular exertion, for example using a roundabout or treadmill actuated by one or more animals, or directly by a human by means of a pedal system; in this latter case, the arrangement of the invention may be provided on a vehicle having its own means for storing energy, which is actuatable by the very energy stored during descent of slopes or when the vehicle is stationary or is in motion on the flat.

In fixed installations it is possible to provide for the use of the compressed air, accumulated in one or more pressure tanks, through a turbine or a cylinder/piston system or other compressed air motor, for example for the actuation of a generator or electrical energy for lighting or the like.

The invention will be better understood with reference to the following description and the accompanying drawings, which show various nonrestrictive embodiments of the invention. In the accompanying drawings:

*Figure 1* is a schematic diagram illustrating an embodiment of the system of the invention wherein natural energy is derived from a water course;

*Figures 2, 3, 4, 5 and 6* show, diagrammatically, respective prime movers which are alternative to that shown in Fig. 1;

*Figure 7* is a diagrammatic side view illustrating an embodiment of the system of the invention, realised as a self-contained vehicle; and

*Figure 8* is a rear view of the vehicle of Fig. 7.

Referring firstly to Fig. 1, in a water course C in which there is a current of water as indicated by the arrow *f* 1, there is mounted a floating rotor 3 which is mounted for rotation between a pair of arms 5 which are coupled at 7 to an anchorage structure, such as a cable 9 extending across the water course; the position of the assembly 3, 5, 7 may, of course, be adapted, in accordance with environmental requirements. The rotor 3 has blades 3A, the lower ones of which are immersed in the water C and receive thrust from the current which causes the rotor 3 to rotate. The rotary motion is transmitted to an air compressor 10, which feeds compressed air, via a line 12 which is appropriately at least in part flexible, to fluid pressure receiving means in the form of a pressure tank 14. The tank 14 is of a capacity and strength such as to permit the compression therein of a considerable volume of air, thereby to provide a relatively large store of energy. This energy can be exploited by a compressed air motor 16, such as a turbine or the like, coupled, for example, to an electrical generator 18; the drive of the motor 16 may be regulated by a control system 20 of suitable kind, which is incorporated into a system 22A, 22B between the tank 14 and the motor 16, to stabilise the speed of the generator 18 and/or vary the power being delivered at any particular instant as a function of practical need due to the applied load.

Fig. 2 illustrates a wind motor 26, which drives a compressor 28 connected to a pressure storage tank similar to the tank 14 of Fig. 1.

Fig. 3 illustrates a system of exploiting animal energy, using a roundabout 30 driven by an animal (in the illustrated case, a horse) which moves around an annular track and driving, through a suitable transmission, a compressor 32 adapted to supply compressed air to a tank, such as the tank 14 of Fig. 1.

Fig. 4 shows a human-powered solution in which a pedalling system 36 drives a compressor 38, again adapted to supply compressed air to a tank like the tank 14 of Fig. 1.

Illustrated in Fig. 5 is a rotor system 40, similar to that of Fig. 1, mounted between oscillating arms 42 extending from a fixed structure and driving a compressor 40. This rotor 40 may be employed where there would be horizontal movements of a liquid mass

because of undulatory or ware motion along a shore; the movement in the two directions indicated by the arrows *f3* causes rotation of the rotor 40 alternately in the two directions by acting on the lowermost blades; this movement is suitably used to drive the compressor 44.

In the system illustrated in Fig. 6 a compressor 50 is drivable by an endothermic motor 52, so this arrangement can supplement a possible lack of natural energy.

In Figs. 7 and 8 there is shown a self-contained vehicle, (which in the drawing has two wheels but which can be of any practical type) with a pedal arrangement 60 which serves to drive either driving wheel 62 of the vehicle or a compressor 64. This compressor 64 will be also driven by the vehicle itself during descent of slopes. In either case compressed air produced by the compressor 64 is stored in tanks 66, the energy of which can be exploited suitably with a compressed air motor such as the motor 68. To recharge the tanks 66 when the vehicle is stationary, a stand 70 may be provided to support the vehicle with the back wheel raised so that operation of the pedal arrangement 60 will drive the compressor 64 to feed compressed air to the tanks 66 without propelling the vehicle.

In each of the illustrated systems it is possible to achieve a sufficient uniformity of energy delivery (in a continuous or intermittent manner, for example for nocturnal illumination) derived from sources of energy which are otherwise not utilisable because of discontinuity and/or unespected availability.

It is understood that the drawings only show illustrative examples given only as practical realisations of the invention, which can be reduced to practice in various forms and dispositions without departing from the scope of the invention as defined by the following claims.

CLAIMS

1. A system of storing energy, derived from the exploitation of natural energy, characterised in that it comprises an air compressor driven by a prime mover adapted to be powered by said natural energy, to compress air which is accumulated in fluid pressure receiver means, from which the pressure energy is exploited as may be desired.

2. A system as claimed in claim 1, characterised in that the prime mover is a wind motor.

3. A system as claimed in claim 1, characterised in that the prime mover is constituted by a hydrodynamic motor which derives its power from a current of water in a water course or horizontal wave motion, e.g. along a sandy shore or beach.

4. A system as claimed in claim 1, characterised in that the prime mover is an animal motor.

5. A system as claimed in claim 3, characterised in that the hydrodynamic motor comprises a rotor having floating blades and connected to arms which allow oscillation thereof in accordance with variation in the level of the water.

6. A system as claimed in any preceding claim, characterised in that it is incorporated into a vehicle and in which the storing of energy is supplemented by energy derived by the vehicle descending slopes or accumulated when the vehicle is stationary or is in motion on the flat, by means of pedal drive.

7. A system of storing energy as gas pressure, and derived from the exploitation of natural energy substantially as hereinbefore described with reference to and as illustrated in Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, or Figs. 7 and 8, of the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1979.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.